ESO 239

COMPETITION AND INDUSTRY DEVELOPMENT

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Since the U.S. economy has traditionally been more open and consumer oriented than most economies, and since the food economy has been the most open sector of the U.S. economy, competition has been the force that determined who supplied what, especially in food. Also, with a few traditional exceptions, the consumer has been allowed to choose the lowest price product that satisfies his needs. The resulting price competition has caused frequent shifts of specialized food production to new areas and sometimes to the demise of production in other areas. For example, in 1935-44, California supplied 24 percent of U.S. processed tomatoes, while in the 1970's the state supplies about 70%.

In the fresh tomato industry, California now furnishes 43 percent of the total fresh crop compared with 18 percent in the 1935-44 period. Even during the August to October period when local tomato harvest is at its seasonal peak, California is a major supplier in midwestern markets. My point is that the vegetable industry is a dynamic one and changes are occurring in areas other than winter vegetables.

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Changes in the Winter Tomato Industry

At this workshop we are concerned primarily with winter season vegetables suitable for greenhouse production. Tomatoes are by far the major winter season greenhouse vegetable, and major changes have occurred in the winter tomato market during the past 20 years. Twenty years ago we consumed primarily the mature green, or "tube" tomato, for the period of November through March. During November and December and April through July, the greenhouse tomato supplemented the mature green supply. Today we have vine ripe tomatoes on a year round basis. The vine ripe tomato formerly was largely an accident and a mistake where someone failed to pick a mature green tomato and at the next pick it was "overripe." Because of its limited shelf life, this product was generally penalized in the market despite its superior eating quality. This still occurs, but to a lesser extent. Today, the vine ripe tomato from Florida, Mexico and California accounts for over half the total supply for this winter period. This means that where the greenhouse tomato had the quality market largely to itself twenty years ago, it has tremendous quality competition today.

Definition of Competition Used

Competition is a force we all favor as long as it keeps the other fellow on his toes and does not hurt our interests. When competitors seriously affect our personal interests, we are inclined to look on such competition as being unfair. The definition of competition used in this paper will be the simple case of the striving by two or more persons or firms to service the

same customers during the winter vegetable season. It is assumed to be a dynamic process in which many factors other than product prices are involved or may be involved.

My evaluation of competitive forces affecting the greenhouse industry will be based on data primarily from the Ohio greenhouse industry, which accounts for some 65-75 percent of U.S greenhouse vegetable production.

Description of Winter Vegetable Industry

Tomatoes accounted for 63 percent of the acreage harvested and 78 percent of the value in 1969 in U.S. greenhouses.[1] Lettuce accounts for most of the remainder, with cucumbers next in importance. In the greenhouse vegetable industry we are dealing with a very small portion of the total supply. The greenhouse tomato industry furnishes less than 5 percent of the total fresh tomato market during the winter season (Figure 1). In certain cities and in some months the percentage is considerably greater.

The heaviest concentration of greenhouse production is in the Cleveland, Ohio, area. Over half the population in the U.S. lies within 500 miles of this area. Because of cloudy winter climate, the tomato harvest is limited largely to October through December and April through July. The fall crop size is less than half that of the spring crop. Production for January through March harvest is economically marginal because of lack of sufficient sunshine

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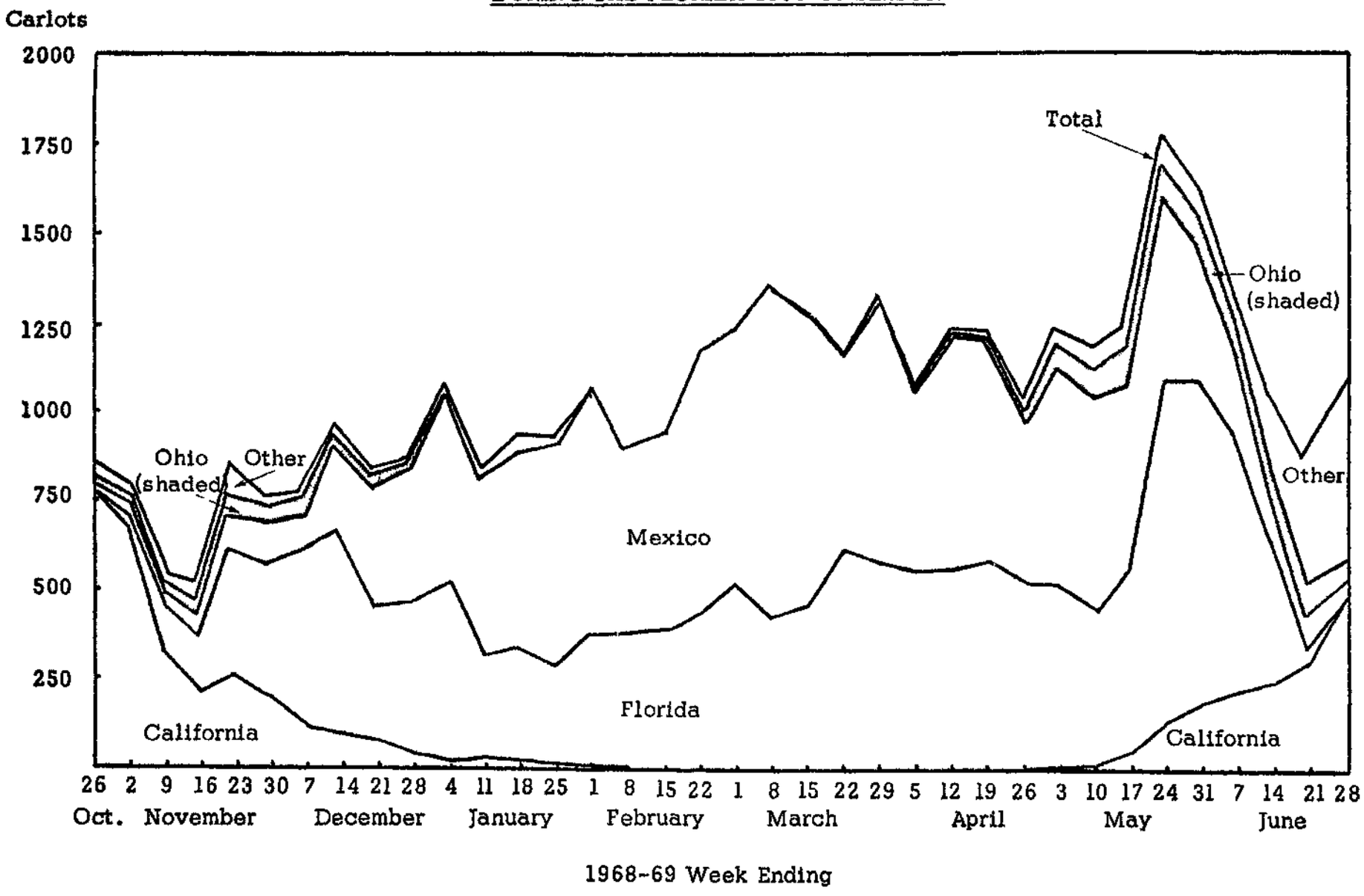
[1]Cravens, M.E., "Comparison of Economics of Winter Production of Horticultural Products in Greenhouses in the U.S. with Outdoor Production in Areas Distant from the Market," Outlook on Agriculture, Vol. 8, No. 2, 1974, Plant Protection Ltd., Jealotts Hill Research Station, Bracknell, Berkshire, RG126EY, England.

Figure 1

TOMATOES: WEEKLY CARLOT MOVEMENT FROM PRINCIPAL PRODUCING AREAS DURING THE FLORIDA 1968-69 SEASON



for tomato fruit growth. The demand for lettuce and other possible crops for this period is limited and their production is generally less profitable than tomatoes. Of course, tomatoes for harvest in April are planted in the greenhouse in January. This constraint of low sunshine is not a factor in greenhouse production in areas where cloudy weather is less common in the winter months.

The relative importance of various aspects of competition in the fresh produce industry are different than in most other industries. Extreme perishability and large fluctuations in supply combine to force constant daily major price adjustments. As a result, there is some tendency to assume that price competition is the only real competition in fresh produce. Fortunately, for the greenhouse vegetable industry, this is not the case. However, since the factors other than price (such as flavor, appearance, and shelf life) are difficult to quantify, they are often "assumed away." Other factors, such as the ability to make emergency deliveries in hours instead of days, provide the nearby greenhouse vegetable marketer a favorable competitive edge. This added service to buyers and the improved communication resulting from nearness are major competitive advantages not covered in price or product differences.

Two studies, one by Ghezelbash in 1957 and the other by Garcha in 1963, showed the demand for greenhouse tomatoes to be quite elastic. In other words, customers shifted to substitute fresh tomatoes when prices changed relative to competing tomatoes.[2] Garcha also found that a 1 percent year-to-year increase in the production of greenhouse tomatoes resulted in a

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[2]Ibid.

0.22 percent decline in price, while a 1 percent change in per capita income resulted in a 1.5 percent change in greenhouse tomato price.

It is probable that the coefficients today would be different than in the late 1950's, when incomes were lower and when the vine ripe tomato was not yet a market factor. Today, the greenhouse tomato is even more difficult to differentiate from its competition and it is likely that the demand is even more elastic.

Cost Comparisons

On the basis of 1967-72 cost and price relationships, the average northern greenhouse tomato grower could not successfully compete on the basis of delivered costs with the producer in climatically favored winter production areas.[3] Two comparisons from a 1974 study may be of interest here, one for capital needs and another for fuel needs. It was assumed that land, labor, technology, management, etc., were essentially equal constraints for greenhouse and outdoor producers in the U.S. The apparent labor saving of Mexican producers amounting to 8-10 cents a pound of tomatoes more than offsets extra transport customs duties and other costs for these producers and was not compared in the study.

It was estimated that capital investment needed, other than land, for greenhouse production in the Cleveland area would be greater by approximately 25-25 cents per pound of annual production than for tomatoes delivered to Cleveland from Mexico or Florida.

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[3]Ibid.

Fuel needs, based on transport of approximately 3200 miles from Mexico and 1000 miles from Florida to Cleveland, compared with heating a greenhouse favored the distant area. Approximately 10,000 gallons of fuel oil were needed for delivery of 200,000 pounds of tomatoes from Mexico compared with 100,000 gallons for the heating of a greenhouse for a comparable quantity of tomatoes. With efficient production and high yields per acre, greenhouse production requires the equivalent of approximately four pounds of fuel oil per pound of tomatoes. Production and transport from Mexico or Florida to Cleveland requires less than one eighth this quantity of fuel.

It was suggested in this analysis based on 1972 data that successful competition in greenhouse tomato production was possible only on the basis of a different and superior product and a favorable tomato price differential. Mention was also made of the possibility of imposing import restrictions for competition from outside U.S. boundaries. However, such restrictions, even in 1972, would have only made the competition more bearable and would not have eliminated the competition faced by the northern greenhouse grower from Florida, Texas or California growers.

The new situation faced in 1974 and later because of fuel shortages, restrictions, and costs is so drastically different from the past that far reaching changes in the location and/or status of the winter greenhouse vegetable industry are certain. The nature of these changes will be determined by both economic and political factors. The actual development may be quite different than what might occur with freely competitive markets for factors of production and for tomatoes.

The manipulation of fuel supplies and prices both by U.S. and foreign governments seems to have few limits. The capricious nature of the fuel price and quantity controls in the past months could discourage most northern U.S. producers or potential producers from even their present levels of production, much less of any expansion based on fossil fuel use. There is simply no way that precise economic planning for greenhouse vegetable production can be accomplished in the present fuel situation where fossil fuel supplies are so uncertain. The best that can be done is to compare two or three assumptions of what might happen over the next 10 to 20 years.

Two constraints in any comparisons are evident. First, glass greenhouses will last 20 to 40 years or more, as will the frame and other structural portions of a plastic greenhouse. This means a long term planning horizon is required. The second is that any temporary or permanent blanket percentage cut in fuel use, say 25 or 50 percent, would so seriously alter the greenhouse operation that any cost computations based on an optimum level, particularly of gas or oil use would be meaningless. The effects of the temporary cutbacks during the winter season would be more serious than the permanent ones for planning purposes, since even temporary low temperatures could destroy the crop.

Under these circumstances, the producer in an area where heat is crucial cannot assume that optimum supplies of any one fuel will be available for an expanded production facility at any price. The alternative is to provide a system capable of using two or three types of fuel depending on price and

availability. As a corollary, provisions for reducing heat loss from the structure can be built-in, where the added capital cost is less than the cost of the heat wasted.

At the present time, Spring 1975, the annual cost of heat to grow two tomato crops, including one soil sterilization, is about $15,000 per acre in Ohio. Some houses having old contracts for gas have costs as low as $10,500 per acre. The average for gas users is about $15,000; for coal users about $22,000; and for fuel oil users about $30,000 per acre. Gas costs are expected to rise to more nearly the level of the other fuels. Variations in costs from greenhouse to greenhouse today, depending on fuel source, are much larger than the total heating costs were two or three years ago. Cost increases of this magnitude are outside our normal experience and the effects of these high costs and variations in costs have not yet been fully realized in either the utilization of present acreage or in the effect on future construction for vegetable greenhouses. Since these costs are apparently here to stay, and perhaps even rise, what does it mean in the future competition between greenhouse and distant outdoor producers?

A "coal standard" appears likely in the future, since coal is our most plentifully available fuel. If costs of heating greenhouses are put on a coal basis, we would have a $22,000 heating bill per acre of glass in the Cleveland area in 1975.[4] This would make fuel, not labor, the most expensive

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[4]There are also problems and questions concerned with environmental quality and further costs of the addition of pollution control systems to the present heating systems in order to comply with current and future directives of the EPA.

input in the production of greenhouse tomatoes in northern Ohio. This increase is about $12,000 per acre more than average 1972 costs, or about 6.5 cents per pound for 1972 yields of greenhouse tomatoes or over 50 cents for an 8-pound basket of tomatoes. It is about equal to the cost of tomato transport from Nogales to Cleveland, and almost twice the cost of transport from southern Florida to eastern and midwestern markets.

Experimentation in Methods for Economizing on Fuel

Whenever a factor of production becomes expensive, the entrepreneur attempts to discover new ways of economizing on its use. The difficulty is that reducing fuel use requires increasing capital use and/or changing crop management and production practices. Some of the practices that are being tested in Ohio greenhouses are:

--Covering sides of greenhouse with aluminized plastic to reduce heat loss out sides. The costs of this practice are small and estimated savings only 1-2 percent of annual heating cost.

--Reduction of night temperatures and allowing higher day temperatures, i.e., 80°F. on sunny days instead of keeping a higher night and lower constant day temperature than now considered optimum.

--Keeping vents closed and relying on fungicides for disease control where formerly the relative humidity was regulated by heat and ventilation for control of disease.

--Varying soil as well as air temperatures.

--The use of double-wall coverning of plastic with air between is in use on some plastic houses with favorable reductions in heat needs. Whether this can be used successfully on glass greenhouses is yet to be proven.

The 1975 cost competition of northern greenhouse vs. tropical area winter vegetable production clearly favors the tropical areas, especially in tomatoes. For lettuce, where heating requirements are less and for the European-type cucumber where production in enclosed areas is essential to prevent pollenation, there is a less clear advantage for the distant, climatically favored production area. However, the market demand for these products is much more limited than that for tomatoes.

Presently available methods of reducing the heat loss and the need for heat in vegetable greenhouses through additions of equipment to facilities, through cropping changes, and through management of day and night temperatures of soil and air in greenhouses offer some hope of success. Present indications are that savings of 10-12 percent may be feasible, although some of this cost reduction may be offset by yield decreases.

Constraints to Production in Outdoor Tropical Areas

The constraints discussed have been primarily concerned with the greenhouse industry. There are also production constraints in the outdoor winter vegetable industries in Florida, Texas and Mexico. For instance, Florida occasionally has freezes, 6 inch tropical rains, wind damage, even hurricanes and an occasional period of extremely high or extremely low temperatures. All of these affect production and product market quality. Mexico

also has these, but to a lesser degree. The difference is that these are predictably unpredictable, while the greenhouse tomato industry constraints, especially high fuel needs and costs, now seem to be certain.

Political constraints aimed at winter vegetables would affect greenhouse and other winter U.S. producers quite similarly. There is no indication that major changes in policy affecting imports of fresh vegetables is likely.

Potential of New Developments in Greenhouse Production

Possible developments that could change the competitive picture include the following:

1. Genetically "improved" greenhouse tomato cultivars that will (a) grow and produce superior quality fruit with the low level of light available December through March in northern Ohio; (b) set fruit and produce with substantially lower night temperatures than present lines; (c) require less time consuming and expensive pollenation than present cultivars; and (d) have higher quality and more predictable market quality characteristics than at present.

2. New and less expensive fuels or heat sources or means of conserving heat such as: (a) new, less expensive fossil fuel sources than present; (b) new and less expensive means of capturing solar heat; (c) nuclear energy; (d) greater use of by-product heat from industrial plants, etc.; and, (e) breakthroughs in elimination of heat losses from greenhouses.

3. Political restrictions, changes in level of customs duties on imports, the provision of subsidies to U.S. greenhouse producers or to outdoor producers in Florida, Texas and California or other ways of favoring one or another producer group.

It appears certain that the decline in acreage and production in the major northern greenhouse vegetable centers such as Cleveland, Toledo and Cincinnati that has been apparent for the past 10 years or so will continue and probably accelerate. Many greenhouses have not been "maintained" in a good state of repair and have not added improved equipment. The level of greenhouse management needed for profitable operation has increased and many of the less well-managed operations have either been living off their depreciation or have gone out of business. New greenhouse construction has been much less than the destruction of old houses. Some greenhouses have shifted from the production of vegetables to bedding plants or flowers and now have successful non-vegetable greenhouse operations.

At the same time that declines in present commercial areas have occurred, it appears that the interest in environmentally controlled winter vegetable production has increased. Part of this is no doubt due to the development of cheap and improved transparent plastics and to the popularity of space age technology. Part has been due to the activities of developers and promoters of systems for the production of vegetables, especially tomatoes, in plastic greenhouses. In an industry where the top commercial growers of tomatoes obtain yields of 100 tons or more per acre, it has been possible for

promoters to sell some investors on the idea that, by doing a superior job, they could get 150 tons per acre and become wealthy. Most have become poorer, but smarter, instead.

Future Nature of Greenhouse Vegetable Industry

Despite the negative factors discussed, greenhouse vegetable production in present locations as well as in new areas is likely to continue. There appears to be a possibility for actually increasing greenhouse production in three different types of areas:

1. Decentralized production in northern U.S. for local sale of a top quality product at high prices, either at the greenhouse or through specialty outlets. These will be highly market-oriented producing units;

2. Greenhouse production in areas distant from market where the major need is protection from wind and tropical rains, where little fuel is required for heating, and where cooling can be accomplished without refrigeration. An estimate based on conditions in southern California suggest that the costs of greenhouse production there in 1972 were about 6 cents per pound less than in northern Ohio. This was about equal to the transport cost from California to Cleveland. No comparable data are available for other areas.

3. Areas where a cheap source of regular or by-product fuel is available. In each of these areas requiring environmental controls success would depend on superior quality and premium prices rather than on lower production and marketing costs than those in climatically favored outdoor areas.

Although environmentally controlled vegetable production offers great hope for the production of large volumes of high quality produce, it appears that economics limit the industry to the supplying of the small percentage of the market willing to pay premium prices. Recent increases in fuel prices have further increased costs and restricted the portion of the market that can be supplied. Of one thing I am certain. As long as consumers have the choice, some are going to buy the quality of winter vegetables that only greenhouses have been able to supply. The real question is how big is this market and who is going to be the producer. As usual, we have to await new developments and scientific breakthroughs for the next chapter of the competition.

COSTS OF GROWING, HARVESTING AND PACKING
AND SELLING GREENHOUSE TOMATOES
1972

	California	Ohio
Annual Fixed Costs		
Depreciation and Interest	$ 15,433	$ 6,270
Real Estate Taxes	3,500	1,530
Other Fixed Costs	3,500	2,000*
Total	20,933	9,800
Annual Variable Costs		
Heating Fuel	$ 3,000	$ 10,020**
Other Variable Costs	17,460	38,700
Total	20,460	48,720
Total Annual Costs	$ 41,393	$ 58,520
Pounds Per Acre	157,680	182,248
Cost Per Pound	26.3	32.1

* Estimated and 1975

** Estimated at $15,000-$30,000 for 1974, depending on fuel used. These estimates are from operators in the Cleveland, Ohio, area where natural gas was $0.72 per 1000 cu. ft., is now contracted at $1.25 and expected to go to $2.00; coal is $31-35 per ton ($22,000) and oil at $0.30 per gallon ($30,000). Some fear may go to $0.45 ($45,000).

SOURCE: Hunter Johnson, Jr., Robert C. Rock, and Paul W. Moore, "Estimated Costs for Producing Greenhouse Tomatoes in California," May 1972, University of California, Riverside.

Richard Duvick and William Short, "Ohio Greenhouse Tomato Summary, 1972 Crop Year," May 1974, Economics and Sociology Occasional Paper No. 215, The Ohio State University, Columbus.